NON-PUBLIC?: N
ACCESSION #: 9405180193
LICENSEE EVENT REPORT (LER)

FACILITY NAME: St. Lucie Unit 2 PAGE: 1 OF 4

DOCKET NUMBER: 05000389

TITLE: Automatic Reactor Trip During Functional Testing of the
Reactor Protective System Due to Bypass Circuit Miswiring
During Original Construction
EVENT DATE: 04/23/94 LER #: 94-003-00 REPORT DATE: 05/12/94

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 029

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Edward Lyons, Shift Technical Advisor TELEPHONE: (407) 465-3550

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: JC COMPONENT: CSL MANUFACTURER: E146
X JI PCV C635
X JI RLY D142
REPORTABLE NPRDS: Y
Y
Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On April 23, 1994 Unit 2 was at 29% reactor power, following a refueling outage. Instrumentation and Control Maintenance (ICM) was performing Linear Power Range Safety and Control Channel Monthly Calibration procedure number 2-1220052 on Reactor Protective System (RPS) channel B, which required the channel to be in bypass. RPS channel D High Power, High Rate of Change of Power (HRCP), Thermal Margin/Low Pressure (TM/LP), Loss of Load and Local Power Density (LPD) bistables were in trip per the Technical Specifications as the Linear Power Range Nuclear Instrumentation card had failed its monthly calibration. Upon commencing channel B calibration the coincidence logic of 2/4 was satisfied and the

reactor tripped at 1318. The utility licensed operators carried out Emergency Operating Procedure-01, Standard Post Trip Actions, and Emergency Operating Procedure-02, Reactor Trip Recovery. The plant was stabilized in mode 3, Hot Standby.

The root cause of the reactor trip was an improperly wired bypass circuit on the RPS channel B Local Power Density bistable. With RPS channel D High Power, High Rate, TM/LP, Loss of Load and LPD bistables in trip and channel B bistables in bypass a trip should not have occurred. Testing by Instrumentation and Control Maintenance (ICM) after the trip indicated that the channel B LPD bypass circuit did not function. The reason was due to a wiring error from the original fabrication. The wiring error did not impact the normal RPS safety function, however ft did prevent the LPD trip unit in channel B from being bypassed.

Corrective actions for this event: 1) ICM repaired RPS channel B LPD bypass circuit, 2) ICM tested all Unit 2 RPS channel bypass circuits satisfactorily and Unit 1 RPS channel bypass circuits will be tested during the next Unit 1 refueling outage, 3) ICM completed calibration of RPS channel B and channel D Linear Power Nuclear Instrumentation and 4) The RPS vendor has been notified of
he wiring error in the bypass
circuit.

END OF ABSTRACT

DESCRIPTION OF THE EVENT

On April 23, 1994 Unit 2 was holding at 29% reactor power for power ascension testing, following a refueling outage. Utility Instrumentation and Control Maintenance (ICM) personnel were in the process of performing ICM Procedure No. 2-1220052, Linear Power Range Safety and Control Channel Monthly Calibration, to calibrate the Reactor Protective System (RPS)(EIIS:JC) Nuclear Instrumentation. During the performance of this calibration, RPS channel D failed to meet acceptance criteria such that personnel were required to place portions of that channel in bypass. This action resulted in disabling the bistables associated with Variable High Power (VHP), High Rate of Change of Power (HRCP), Thermal Margin/Low Pressure (TM/LP), Loss of Load and Local Power Density (LPD) for the affected channel.

Due to the uncertain time period for restoration of the RPS channel D Linear Range Nuclear Instrumentation, the calibration proceeded on the remaining three channels. As per the Technical Specifications this

required that the RPS channel D bistables for VHP, HRCP, TM/LP, Loss of Load and LPD be placed in the trip condition, which reduces RPS coincidence logic from 2/4 to 1/3 for automatic trip actuation. Personnel then proceeded to perform the portion of the monthly calibration unique to channel B. The affected bistables were placed in the bypass position in accordance with the procedure prior to operating the Linear Calibrate switch. ICM personnel then placed the Linear Calibrate switch in the 200% power position to test bistables in the trip condition for channel B. Upon initiation of this step the reactor automatically tripped at 1318.

The utility licensed operators implemented Emergency Operating Procedure-01, Standard Post Trip Actions. At this time a utility licensed operator noted that the Steam Bypass Control System (SBCS) (EIIS:JI) did not function as expected. PCV-8801 did not open and instead PCV-8802 was controlling Reactor Coolant System (RCS) temperature. Approximately five minutes after the plant trip the SBCS valves opened which resulted in a minor Reactor Coolant System (RCS) (EIIS:AB) cooldown transient. A utility licensed operator then placed the SBCS in manual and the RCS cooldown was stopped.

Emergency Operating Procedure-02, Reactor Trip Recovery, was completed. The plant was stabilized in mode 3, Hot Standby.

CAUSE OF THE EVENT

The root cause of the reactor trip was an improperly wired bypass circuit on the RPS channel B LPD bistable. With RPS channel D LPD bistable in trip, due to the Nuclear Instrumentation failing to meet the calibration acceptance criteria, and channel B LPD bistable in bypass a reactor trip should not have occurred. Testing by ICM after the trip indicated that the channel B LPD bypass circuit did not function. The wiring error did not impact the normal RPS safety function, however it did prevent the LPD trip unit in channel B from being bypassed. It was further discovered that this sequence could only occur with channel D LPD in trip and channel B LPD in bypass.

The cause of PCV-8801 not opening was due to mechanical binding. Valve disassembly revealed mechanical binding between the guide bushing and upper stem.

The cause of the minor cooldown was a result of the SBCS valves spuriously opening.

ANALYSIS OF THE EVENT

This event is reportable under 10 CFR 50.73.a.2.iv as "any event or condition that resulted in manual or automatic actuation of any engineered safety feature, including the Reactor Protection System." The Auxiliary Feedwater System and Main Steam Safety Valves were available but due to the low power nature of this trip they were not required to operate.

This trip was due to a fabrication wiring error (a wire was landed on the wrong terminal) in the bypass circuit of the channel B Local Power Density bistable. According to section 7.2.2.2.3 of the PSL Unit 2 Final Safety Analysis Report, the purpose of the LPD trip is "to prevent the linear heat rate (kw/ft) in the limiting fuel pin in the core from exceeding the fuel performance guidelines in the event of any Moderate Frequency Event or Infrequent Event." Even with the wiring error, the safety function was never compromised. The LPD bistable trip and logic matrix have been continuously tested since RPS installation and would have functioned to trip the reactor if event circumstances warranted. The purpose of the RPS bistable bypass circuit is provided to enable maintenance testing of the system.

The plant response to the minor cooldown transient experienced following the reactor trip was bounded by section 15.1.5 of the PSL Unit 2 Final Safety Analysis Report, Increased Heat Removal by the Secondary system. Timely response by the utility licensed operators secured the cooldown. During post trip recovery actions the minimum RCS temperature was 521 degrees F, the minimum RCS pressure was 2070 psia and the minimum Pressurizer level was 23%. The nominal post trip values are: RCS temperature at 525-535 degrees F, RCS pressure at 2225-2275 psia and Pressurizer level at 27-35%.

Therefore the health and safety of the public were not at risk at any time during this event.

CORRECTIVE ACTIONS

1) Instrumentation and Control Maintenance (ICM) repaired RPS channel B LPD bypass circuit.

2) ICM tested all other Unit 2 RPS channel bypass circuits. All tested satisfactorily. Unit 1 RPS channel bypass circuits will be tested during the next Unit 1 refueling outage.

3) ICM completed calibration of channel B and channel D Linear Power Nuclear Instrumentation.

4) The RPS vendor has been notified of the wiring error in the bypass circuit.

5) Mechanical Maintenance (MM) and ICM rebuilt SBCS valve PCV-8801. Improvements are being made in the maintenance program for both Unit 1 &2 SBCS valves.

6) ICM replaced a failed SBCS relay and temporary instrument recorders have been installed to continue monitoring the performance of the SBCS circuitry.

7) Lessons learned from this event will be shared on the INPO Nuclear Network.

ADDITIONAL INFORMATION

Failed Components:
Local Power Density Bistable bypass circuit, Electro-Mechanics Inc.
PCV-8801, Copes-Vulcan Inc., model # D-100-8
SBCS relay, Devar Inc., model # 19-506

Previous Similar Events:
There have been no previous reactor trips caused by RPS wiring errors.

ATTACHMENT TO 9405180193 PAGE 1 OF 1

FPL Florida Power & Light Company, P.O. Box 128,
Fort Pierce, FL 34954-0128

May 12, 1994

L-94-122
10 CFR 50.73

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Re: St. Lucie Unit 2
Docket No. 50-389
Reportable Event: 94-003
Date of Event: April 23, 1994
Automatic Reactor Trip During Functional Testing of the Reactor

Protective System Due to Bypass Miswiring During Original Construction

The attached Licensee Event Report is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

Very truly yours,

D. A. Sager
Vice President
St. Lucie Plant

DAS/JWH/kw

Attachment

cc: Stewart D. Ebneter, Regional Administrator, USNRC Region II
Senior Resident Inspector, USNRC, St. Lucie Plant

DAS/PSL #1122-94

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